

2016

DRINKING WATER SURVEILLANCE PROGRAM

**ALVINSTON
WATER TREATMENT
PLANT**

ANNUAL REPORT 1990

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WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

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EXECUTIVE SUMMARY
DRINKING WATER SURVEILLANCE PROGRAM
ALVINSTON WATER TREATMENT PLANT
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Alvinston water treatment plant is a conventional treatment plant which treats water from the Sydenham River. The process consists of coagulation, flocculation, clarification (upflow solids contact clarifier), filtration, post pH adjustment and disinfection. Powdered activated carbon is added for taste and odour control and pesticide removal. The process of complete water softening was initiated in the spring of 1989 and discontinued in the summer of 1990. This plant has a design capacity of $0.755 \times 1000 \text{ m}^3/\text{day}$. The Alvinston water treatment plant serves a population of approximately 700.

Water at the plant and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Alvinston water treatment plant, for the sample year of 1990, produced good quality water and this was maintained in the distribution system.

The raw water source was adversely affected by agricultural activity.

TABLE A
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A " " INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	RAW SITE			TREATED			SITE 1		
	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	12	12	100	4	0	0	3	0	0
CHEMISTRY (FLO)	12	11	91	24	23	95	18	18	100
CHEMISTRY (LAG)	88	81	92	88	73	82	95	86	90
METALS	96	48	50	96	39	40	115	51	44
CHLOROCARONATICS	56	0	0	56	0	0	42	0	0
CHLOROPHENOLS	12	0	0	6	0	0	.	.	.
PAH	68	0	0	68	0	0	.	.	.
PESTICIDES & PCB	138	1	0	138	1	0	65	0	0
PHENOLICS	4	1	25	4	1	25	.	.	.
SPECIFIC PESTICIDES	54	1	1	49	0	0	3	0	0
VOLATILES	116	0	0	116	15	12	87	12	13
TOTAL	656	155	649	152	428	167			

DRINKING WATER SURVEILLANCE PROGRAM

ALVINSTON WATER TREATMENT PLANT 1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Alvinston water treatment plant in the summer of 1985 as part of the Alachlor pesticide study in Southwestern Ontario. Previous annual reports have been published for 1986, 1987, 1988 and 1989.

PLANT DESCRIPTION

The Alvinston water treatment plant is a conventional treatment plant which treats water from the Sydenham River. The process consists of coagulation, flocculation, clarification (upflow solids contact clarifier), filtration, post pH adjustment and disinfection. Powdered activated carbon is added for taste and odour control and pesticide removal. The process of complete water softening was initiated in the spring of 1989 and discontinued in the summer of 1990. This plant has a design capacity of $0.755 \times 1000 \text{ m}^3/\text{day}$. The Alvinston water treatment plant serves a population of approximately 700.

The sample day flows ranged from $0.2 \times 1000 \text{ m}^3/\text{day}$ to $0.4 \times 1000 \text{ m}^3/\text{day}$.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted

of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment

laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- THE TREATED AND DISTRIBUTED WATER;
- ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND
- POSITIVE ORGANIC PARAMETERS DETECTED.

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count was the only bacteriological analysis conducted on the treated and distributed water. No results were above the guideline.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance

organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 3 of 6 treated and distributed water samples with a maximum reported value of 17.5°C.

CHEMISTRY (LAB)

Calcium exceeded the European Economic Community (EEC) Aesthetic Guideline Level of 100 mg/L in 4 of 7 treated and distributed water samples with a maximum reported value of 110.1 mg/L.

Elevated conductivity is often associated with high hardness levels.

Conductivity exceeded the EEC Aesthetic Guideline Level of 400 umho/cm in 7 of 7 treated and distributed water samples with a maximum reported value of 750.0 umho/cm.

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in 7 of 7 treated and distributed water samples with a maximum reported value of 359.4 mg/L. The softening process at the plant, which should reduce hardness, does not appear to be very effective.

Total ammonium exceeded the EEC Aesthetic Guideline Level of 0.05 mg/L in 1 of 4 treated water samples with a maximum reported value of 0.09 mg/L.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of Turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWOs Maximum Acceptable Concentration for turbidity is 1.0 Formazin Turbidity Units (FTU).

The lab turbidity exceeded the Maximum Acceptable Concentration in one treated water sample at 1.5 FTU but this was not confirmed by

the corresponding field turbidity result which was considered more reliable.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 7 of 7 treated and distributed water samples with a maximum reported value of 550.0 ug/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

Atrazine was found at positive levels in 1 of the 4 treated water samples analyzed. The maximum observed level was 520.0 ng/L. This was below the ODWO Interim Maximum Acceptable Concentration of 60,000 ng/L.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results exceeded the guideline.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected above trace levels.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 7 treated and distributed water samples analyzed with a maximum level of 168.2 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

The Alvinston water treatment plant, for the sample year of 1990, produced good quality water and this was maintained in the distribution system.

No known health related guidelines were exceeded.

As stated in previous annual reports, the 1990 DWSP results indicate that the raw water source is adversely affected by agricultural activities in the watershed.

FIGURE 1

ALVINSTON WATER TREATMENT PLANT

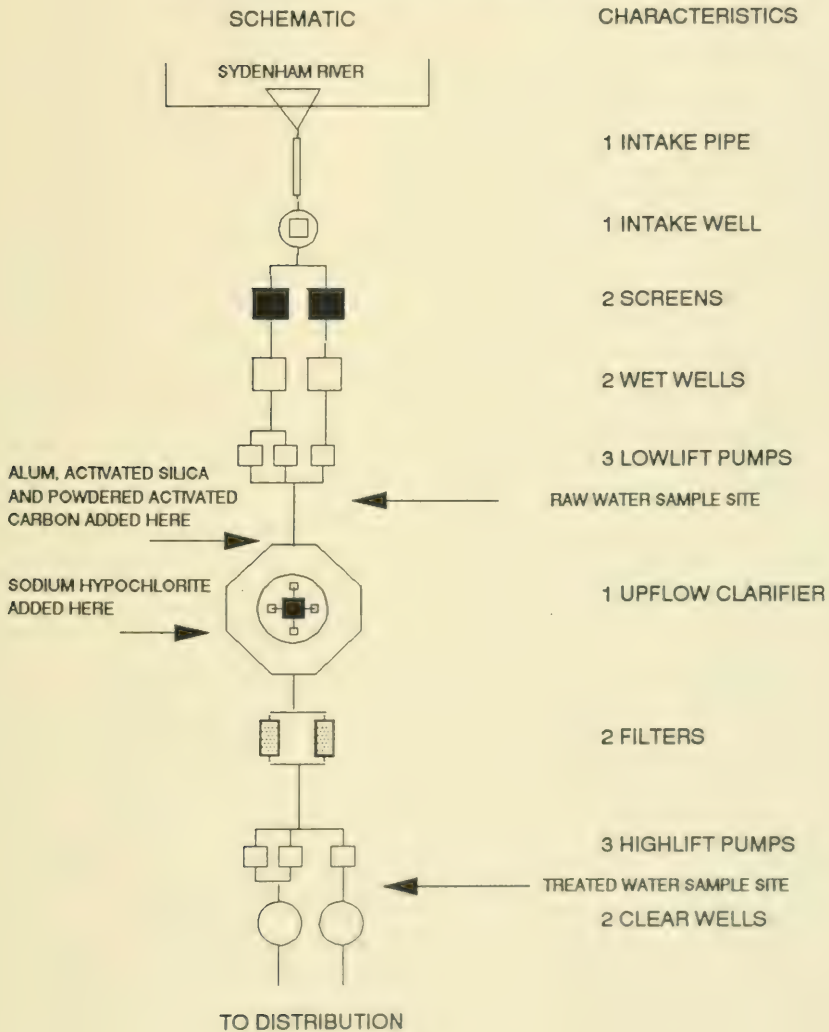


TABLE 1
DRINKING WATER SURVEILLANCE PROGRAM
PLANT GENERAL REPORT

WORKS #: 210001068
PLANT NAME: ALVINSTON WTP

DISTRICT: SARNIA
REGION: SOUTHWEST
DISTRICT OFFICER :O. WIGLE

UTM #: 174297004740900

PLANT SUPERINTENDENT: MR. TOM WRIGHT

ADDRESS: P.O. BOX 29
ALVINSTON, ONTARIO
N0N 1A0
(519 898 2047)

MUNICIPALITY: ALVINSTON
AUTHORITY: PROVINCIAL

PLANT INFORMATION

PLANT VOLUME:	.286	(X 1000 M3)
DESIGN CAPACITY:	.775	(X 1000 M3/DAY)
RATED CAPACITY:	-	(X 1000 M3/DAY)

<u>MUNICIPALITY</u>	<u>POPULATION</u>
ALVINSTON	700

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER -----	LOCATION -----	FREQUENCY -----
COMBINED CHLORINE RESIDUAL	TREATED WATER	3 READINGS/DAY
TOTAL CHLORINE RESIDUAL	TREATED WATER	3 READINGS/DAY
PH	RAW WATER	DAILY READING
	TREATED WATER	DAILY READING
TEMPERATURE	TREATED WATER	DAILY READING
TURBIDITY	TREATED WATER	DAILY READING

TABLE 3
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP SAMPLE DAY CONDITIONS FOR 1990

DATE	DELAY * TIME(HRS)	FLOW (1000M3)	TREATMENT CHEMICAL DOSAGES (MG/L)		TASTE & ODOUR	POST CHLORINATION	CALCIUM HYDROXIDE	CARBON DIOXIDE	SODIUM CARBONATE
			COAGULATION	POLYELECTROLYTE					
			ALUM LIQUID		POWDER ACTIVATED CARBON	SODIUM HYPOCHLORITE			
FEB 19	.00	.213	34.00	.04	5.00	2.00	50.00		
JUN 26	.75	.582	48.00	.04	20.00	3.00	60.00	4.00	30.00
OCT 29	6.00	.236	25.00	.04	10.00	5.50			
DEC 18	7.00	.295	30.00	.04	10.00	2.60			

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE

BACTERIOLOGICAL									
FECAL COLIFORM MF	4	4	0	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	4	0	0	3	0	0
TOTAL COLIFORM MF	4	4	0	.	.	.	.	.	.
T COLIFORM BCKGRD MF	4	4	0	.	.	.	.	.	.

*TOTAL GROUP BACTERIOLOGICAL	12	12	0	4	0	0	3	0	0

CHEMISTRY (FLD)									
FLD CHLORINE (COMB)	.	.	.	4	4	0	4	4	0
FLD CHLORINE FREE	.	.	.	4	4	0	4	4	0
FLD CHLORINE (TOTAL)	.	.	.	4	4	0	4	4	0
FLD PH	4	4	0	4	4	0	1	1	0
FLD TEMPERATURE	4	3	0	4	3	0	4	4	0
FLD TURBIDITY	4	4	0	4	4	0	1	1	0

*TOTAL SCAN CHEMISTRY (FLD)	12	11	0	24	23	0	18	18	0

CHEMISTRY (LAB)									
ALKALINITY	4	4	0	4	4	0	5	5	0
CALCIUM	4	4	0	4	4	0	5	5	0
CYANIDE	4	0	1	4	0	0	.	.	.
CHLORIDE	4	4	0	4	4	0	5	5	0
COLOUR	4	4	0	4	4	0	5	4	1
CONDUCTIVITY	4	4	0	4	4	0	5	5	0
DISS ORG CARBON	4	4	0	4	4	0	5	5	0
FLUORIDE	4	4	0	4	4	0	5	5	0
HARDNESS	4	4	0	4	4	0	5	5	0
IONCAL	4	4	0	4	4	0	5	5	0
LANGELIERS INDEX	4	4	0	4	4	0	5	5	0
MAGNESIUM	4	4	0	4	4	0	5	5	0
SODIUM	4	4	0	4	4	0	5	5	0
AMMONIUM TOTAL	4	1	1	4	1	2	5	1	3
NITRITE	4	4	0	4	2	1	5	1	3
TOTAL NITRATES	4	4	0	4	4	0	5	5	0
NITROGEN TOT KJELD	4	4	0	4	4	0	5	5	0
PH	4	4	0	4	4	0	5	5	0
PHOSPHORUS FIL REACT	4	4	0	4	1	3	.	.	.
PHOSPHORUS TOTAL	4	4	0	4	1	3	.	.	.
SULPHATE	4	4	0	4	4	0	5	5	0
TURBIDITY	4	4	0	4	4	0	5	5	0

*TOTAL SCAN CHEMISTRY (LAB)	88	81	2	88	73	9	95	86	7

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE

METALS									
SILVER	4	0	0	4	0	0	5	0	0
ALUMINUM	4	4	0	4	4	0	5	5	0
ARSENIC	4	3	1	4	0	4	5	0	5
BARIUM	4	4	0	4	4	0	5	5	0
BORON	4	4	0	4	4	0	5	5	0
BERYLLIUM	4	0	2	4	0	1	5	0	2
CADMIUM	4	0	0	4	0	1	5	0	0
COBALT	4	0	4	4	0	3	5	0	4
CHROMIUM	4	1	3	4	0	4	5	2	3
COPPER	4	0	4	4	0	4	5	0	5
IRON	4	4	0	4	0	1	5	0	0
MERCURY	4	0	1	4	0	0	.	.	.
MANGANESE	4	4	0	4	4	0	5	5	0
MOLYBDENUM	4	2	2	4	4	0	5	5	0
NICKEL	4	0	2	4	0	1	5	0	3
LEAD	4	2	2	4	0	3	5	0	5
ANTIMONY	4	0	4	4	1	3	5	0	5
SELENIUM	4	0	2	4	0	3	5	0	5
STRONTIUM	4	4	0	4	4	0	5	5	0
TITANIUM	4	4	0	4	4	0	5	5	0
THALLIUM	4	0	0	4	0	0	5	0	0
URANIUM	4	4	0	4	4	0	5	5	0
VANADIUM	4	4	0	4	4	0	5	5	0
ZINC	4	4	0	4	2	2	5	4	1

*TOTAL SCAN METALS	96	48	27	96	39	30	115	51	38
*TOTAL GROUP INORGANIC & PHYSICAL	196	140	29	208	135	39	228	155	45

CHLOROAROMATICS									
HEXACHLOROBUTADIENE	4	0	0	4	0	0	3	0	0
123 TRICHLOROBENZENE	4	0	0	4	0	0	3	0	0
1234 T-CHLOROBENZENE	4	0	0	4	0	0	3	0	0
1235 T-CHLOROBENZENE	4	0	0	4	0	0	3	0	0
124 TRICHLOROBENZENE	4	0	0	4	0	0	3	0	0
1245 T-CHLOROBENZENE	4	0	0	4	0	0	3	0	0
135 TRICHLOROBENZENE	4	0	0	4	0	0	3	0	0
HCB	4	0	0	4	0	0	3	0	0
HEXACHLOROETHANE	4	0	0	4	0	0	3	0	0
OCTACHLOROSTYRENE	4	0	0	4	0	0	3	0	0
PENTACHLOROBENZENE	4	0	0	4	0	0	3	0	0
236 TRICHLOROTOLUENE	4	0	0	4	0	0	3	0	0
245 TRICHLOROTOLUENE	4	0	0	4	0	0	3	0	0
26A TRICHLOROTOLUENE	4	0	0	4	0	0	3	0	0

*TOTAL SCAN CHLOROAROMATICS	56	0	0	56	0	0	42	0	0

CHLOROPHENOLS									

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
234 TRICHLOROPHENOL	2	0	0	1	0	0	.	.	.
2345 T-CHLOROPHENOL	2	0	0	1	0	0	.	.	.
2356 T-CHLOROPHENOL	2	0	0	1	0	0	.	.	.
245-TRICHLOROPHENOL	2	0	0	1	0	0	.	.	.
246-TRICHLOROPHENOL	2	0	0	1	0	0	.	.	.
PENTACHLOROPHENOL	2	0	0	1	0	0	.	.	.
*TOTAL SCAN CHLOROPHENOLS	12	0	0	6	0	0	0	0	0

PAH

PHENANTHRENE	4	0	0	4	0	0	.	.	.
ANTHRACENE	4	0	0	4	0	0	.	.	.
FLUORANTHENE	4	0	0	4	0	0	.	.	.
PYRENE	4	0	0	4	0	0	.	.	.
BENZO(A)ANTHRACENE	4	0	0	4	0	0	.	.	.
CHRYSENE	4	0	0	4	0	0	.	.	.
DIMETH. BENZ(A)ANTHR	4	0	0	4	0	0	.	.	.
BENZO(E) PYRENE	4	0	0	4	0	0	.	.	.
BENZO(B) FLUORANTHENE	4	0	0	4	0	0	.	.	.
PERYLENE	4	0	0	4	0	0	.	.	.
BENZO(K) FLUORANTHENE	4	0	0	4	0	0	.	.	.
BENZO(A) PYRENE	4	0	0	4	0	0	.	.	.
BENZO(G,H,I) PERYLENE	4	0	0	4	0	0	.	.	.
DIBENZO(A,H) ANTHRAC	4	0	0	4	0	0	.	.	.
INDENO(1,2,3-C,D) PY	4	0	0	4	0	0	.	.	.
BENZO(B) CHRYSENE	4	0	0	4	0	0	.	.	.
CORONENE	4	0	0	4	0	0	.	.	.
*TOTAL SCAN PAH	68	0	0	68	0	0	0	0	0

PESTICIDES & PCB

ALDRIN	4	0	0	4	0	0	3	0	0
ALPHA BHC	4	0	0	4	0	0	3	0	0
BETA BHC	4	0	0	4	0	0	3	0	0
LINDANE	4	0	2	4	0	0	3	0	0
ALPHA CHLORDANE	4	0	0	4	0	0	3	0	0
GAMMA CHLORDANE	4	0	0	4	0	0	3	0	0
DIELDRIN	4	0	0	4	0	0	3	0	0
METHOXYCHLOR	4	0	0	4	0	0	3	0	0
ENDOSULFAN I	4	0	1	4	0	0	3	0	0
ENDOSULFAN II	4	0	0	4	0	0	3	0	0
ENDRIN	4	0	0	4	0	0	3	0	0
ENDOSULFAN SULPHATE	4	0	0	4	0	0	3	0	0
HEPTACHLOR EPOXIDE	4	0	0	4	0	0	3	0	0
HEPTACHLOR	4	0	0	4	0	0	3	0	0
MIREX	4	0	0	4	0	0	3	0	0
OXYCHLORDANE	4	0	0	4	0	0	3	0	0
OPDDT	4	0	0	4	0	0	3	0	0
PCB	4	0	0	4	0	0	3	0	0
DDD	4	0	0	4	0	0	3	0	0
PPDDE	4	0	0	4	0	0	3	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	4	0	0	4	0	0	3	0	0
AMETRINE	4	0	0	4	0	0	.	.	.
ATRAZINE	4	1	3	4	1	0	.	.	.
ATRATONE	4	0	0	4	0	0	.	.	.
CYANAZINE (BLADEX)	4	0	0	4	0	0	.	.	.
DESETHYLATRAZINE	4	0	3	4	0	0	.	.	.
D-ETHYL SIMAZINE	4	0	0	4	0	0	.	.	.
PROMETONE	4	0	0	4	0	0	.	.	.
PROPACINE	4	0	0	4	0	0	.	.	.
PROMETRYNE	4	0	0	4	0	0	.	.	.
METRIBUZIN (SENCOR)	4	0	0	4	0	0	.	.	.
SIMAZINE	4	0	0	4	0	0	.	.	.
ALACHLOR (LASSO)	4	0	0	4	0	0	.	.	.
METOLACHLOR	4	0	1	4	0	0	.	.	.
HEXACLCYCLOPENTADIEN	2	0	0	2	0	0	2	0	0
*TOTAL SCAN PESTICIDES & PCB	138	1	10	138	1	0	65	0	0

PHENOLICS									
PHENOLICS	4	1	1	4	1	1	.	.	.
*TOTAL SCAN PHENOLICS	4	1	1	4	1	1	0	0	0

SPECIFIC PESTICIDES									
TOXAPHENE	4	0	0	4	0	0	3	0	0
2,4,5-T	2	0	0	1	0	0	.	.	.
2,4-D	2	0	0	1	0	0	.	.	.
2,4-DB	2	0	0	1	0	0	.	.	.
2,4 D PROPIONIC ACID	2	0	0	1	0	0	.	.	.
DICAMBA	1	0	0	1	0	0	.	.	.
PICHLORAM	0	0	0	0	0	0	.	.	.
SILVEX	2	0	0	1	0	0	.	.	.
DIAZINON	2	0	0	2	0	0	.	.	.
DICHLOROVOS	2	0	0	2	0	0	.	.	.
CHLORPYRIFOS	2	0	0	2	0	0	.	.	.
ETHION	2	0	0	2	0	0	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.
MALATHION	2	0	0	2	0	0	.	.	.
MEVINPHOS	2	0	0	2	0	0	.	.	.
METHYL PARATHION	2	0	0	2	0	0	.	.	.
METHYLTRITHION	2	0	0	2	0	0	.	.	.
PARATHION	2	0	0	2	0	0	.	.	.
PHORATE	1	0	0	1	0	0	.	.	.
RELDAN	2	0	0	2	0	0	.	.	.
RONNEL	2	0	0	2	0	0	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.
BENONYL	0	0	0	0	0	0	.	.	.
BLX	0	0	0	0	0	0	.	.	.
CARBOFURAN	2	0	0	2	0	0	.	.	.
CICP	2	0	0	2	0	0	.	.	.
DIALATE	2	0	0	2	0	0	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	2	0	0	2	0	0	.	.	.
IPC	2	0	0	2	0	0	.	.	.
PROPOXUR	2	0	0	2	0	0	.	.	.
CARBARYL	2	1	0	2	0	1	.	.	.
BUTYLATE	2	0	0	2	0	0	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	54	1	0	49	0	1	3	0	0

VOLATILES									
BENZENE	4	0	0	4	0	0	3	0	0
TOLUENE	4	0	0	4	0	0	3	0	1
ETHYLBENZENE	4	0	1	4	0	3	3	0	3
P-XYLENE	4	0	0	4	0	0	3	0	0
M-XYLENE	4	0	0	4	0	0	3	0	1
O-XYLENE	4	0	0	4	0	0	3	0	1
STYRENE	4	0	3	4	0	4	3	0	2
1,1 DICHLOROETHYLENE	4	0	0	4	0	0	3	0	0
METHYLENE CHLORIDE	4	0	0	4	0	0	3	0	0
1,2 DICHLOROETHYLENE	4	0	0	4	0	0	3	0	0
1,1 DICHLOROETHANE	4	0	0	4	0	0	3	0	0
CHLOROFORM	4	0	0	4	4	0	3	3	0
111, TRICHLOROETHANE	4	0	1	4	0	0	3	0	0
1,2 DICHLOROETHANE	4	0	0	4	0	0	3	0	0
CARBON TETRACHLORIDE	4	0	0	4	0	0	3	0	0
1,2 DICHLOROPROPANE	4	0	0	4	0	0	3	0	0
TRICHLOROETHYLENE	4	0	0	4	0	0	3	0	0
DICHLOROBROMOMETHANE	4	0	0	4	4	0	3	3	0
112 TRICHLOROETHANE	4	0	0	4	0	0	3	0	0
CHLORODIBROMOMETHANE	4	0	0	4	3	1	3	3	0
T-CHLOROETHYLENE	4	0	0	4	0	1	3	0	1
BROMOFORM	4	0	0	4	0	0	3	0	0
1122 T-CHLOROETHANE	4	0	0	4	0	0	3	0	0
CHLOROBENZENE	4	0	0	4	0	0	3	0	0
1,4 DICHLOROBENZENE	4	0	0	4	0	0	3	0	0
1,3 DICHLOROBENZENE	4	0	0	4	0	0	3	0	0
1,2 DICHLOROBENZENE	4	0	0	4	0	0	3	0	0
ETHYLENE DIBROMIDE	4	0	0	4	0	0	3	0	0
TOTL TRIHALOMETHANES	4	0	0	4	4	0	3	3	0
*TOTAL SCAN VOLATILES	116	0	5	116	15	9	87	12	9
*TOTAL GROUP ORGANIC	448	3	16	437	17	11	197	12	9

KEY TO TABLE 5 and 6

- A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline
- B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)
- C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV
- D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH
- F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissible Concentration (MADC)
- G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE
- I NEW YORK STATE AMBIENT WATER GUIDELINE
- N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
ICS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminate Interference
XP	Positive After X Number Of Hours
T#	(T06) Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

STANDING

FREE FLOW

BACTERIOLOGICAL

FECAL COLIFORM MF (CT/100ML)

DET'N LIMIT = 0

GUIDELINE = 0 (A1)

FEB	4	.	.	.
JUN	352	.	.	.
OCT	48	.	.	.
DEC	168	.	.	.

STANDRD PLATE CNT MF (COUNTS/ML)

DET'N LIMIT = 0

GUIDELINE = 500/ML (A3)

FEB	.	0 <=>	.	.
JUN	.	4 <=>	.	0 <=>
OCT	.	2 <=>	.	4 <=>
DEC	.	8 <=>	.	2 <=>

TOTAL COLIFORM MF (CT/100ML)

DET'N LIMIT = 0

GUIDELINE = 5/100ML(A1)

FEB	1000	.	.	.
JUN	1700	.	.	.
OCT	1300	.	.	.
DEC	54000	.	.	.

T COLIFORM BCKGRD MF (CT/100ML)

DET'N LIMIT = 0

GUIDELINE = N/A

FEB	8600	.	.	.
JUN	49000	.	.	.
OCT	17000	.	.	.
DEC	20000	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

STANDING

FREE FLOW

CHEMISTRY (FLD)

FLD CHLORINE (COMB) (MG/L)		DET'N LIMIT = 0	GUIDELINE = N/A
FEB	.300	.	.
JUN	.300	.	.200
OCT	.200	.200	.200
DEC	.300	.200	.

FLD CHLORINE FREE (MG/L)		DET'N LIMIT = 0	GUIDELINE = N/A
FEB	.300	.	.
JUN	.800	.	.200
OCT	1.000	.400	.400
DEC	1.000	.100	.

FLD CHLORINE (TOTAL) (MG/L)		DET'N LIMIT = 0	GUIDELINE = N/A
FEB	.600	.	.
JUN	1.100	.	.400
OCT	1.200	.600	.600
DEC	1.300	.300	.

FLD PH (DMNSLESS)		DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)
FEB	7.630	7.750	.
JUN	7.840	7.640	7.800
OCT	8.300	8.200	.
DEC	7.900	7.800	.

FLD TEMPERATURE (DEG.C)		DET'N LIMIT = N/A	GUIDELINE = 15 (A3)
FEB	.000	.000	.
JUN	18.000	16.500	17.500
OCT	5.000	7.000	16.000
DEC	2.000	3.000	10.000

FLD TURBIDITY (FTU)		DET'N LIMIT = N/A	GUIDELINE = 1 (A1)
FEB	10.000	.090	.
JUN	55.000	.240	.480
OCT	30.000	.110	.
DEC	30.000	.160	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED		SITE 1	
		STANDING		FREE FLOW	
CHEMISTRY (LAB)					
ALKALINITY (MG/L)		DET'N LIMIT = 0.2		GUIDELINE = 30-500 (A4)	
FEB	235.000	156.200	.	.	.
JUN	220.400	208.200	.	205.800	.
OCT	270.100	274.600	241.600	239.600	.
DEC	254.100	252.000	251.400	250.500	.
CALCIUM (MG/L)		DET'N LIMIT = 0.2		GUIDELINE = 100 (F2)	
FEB	102.900	96.000	.	.	.
JUN	104.400	110.100	.	93.800	.
OCT	107.900	109.300	100.100	98.100	.
DEC	109.000	105.000	105.600	105.000	.
CYANIDE (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = .2 (A1)	
FEB	BDL	BDL	.	.	.
JUN	.003 <T	BDL	.	.	.
OCT	BDL	BDL	.	.	.
DEC	BDL	BDL	.	.	.
CHLORIDE (MG/L)		DET'N LIMIT = 0.2		GUIDELINE = 250 (A3)	
FEB	34.600	38.500	.	.	.
JUN	29.600	33.900	.	31.400	.
OCT	29.500	33.500	33.400	33.500	.
DEC	27.200	31.600	29.600	30.100	.
COLOUR (HZU)		DET'N LIMIT = 0.5		GUIDELINE = 5 (A3)	
FEB	11.000	3.000	.	.	.
JUN	18.000	5.000	.	1.500 <T	.
OCT	12.000	3.000	4.000	4.000	.
DEC	20.000	3.000	3.500	3.500	.
CONDUCTIVITY (UMHO/CM)		DET'N LIMIT = 1.		GUIDELINE = 400 (F2)	
FEB	707	683	.	.	.
JUN	681	748	.	674	.
OCT	717	750	707	701	.
DEC	671	701	695	698	.
DISS ORG CARBON (MG/L)		DET'N LIMIT = .100		GUIDELINE = 5.0 (A3)	
FEB	3.900	2.700	.	.	.
JUN	5.300	4.100	.	2.800	.
OCT	4.000	3.000	2.900	3.100	.
DEC	5.100	3.800	3.500	3.400	.
FLUORIDE (MG/L)		DET'N LIMIT = 0.01		GUIDELINE = 2.4 (A1)	
FEB	.120	.100	.	.	.
JUN	.140	.120	.	.100	.
OCT	.140	.140	.140	.140	.
DEC	.140	.120	.100	.120	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

STANDING

FREE FLOW

HARDNESS (MG/L)		DET'N LIMIT = 0.5		GUIDELINE = 80-100 (A4)
FEB	335.400	315.500	.	.
JUN	339.500	351.000	.	307.400
OCT	356.300	359.400	335.500	330.900
DEC	353.000	344.000	343.600	343.000
TONGAL (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = N/A
FEB	4.836	.350	.	.
JUN	3.250	4.333	.	1.976
OCT	1.975	4.923	2.331	3.125
DEC	.134	4.231	3.536	4.180
LANGELIERS INDEX (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = N/A
FEB	1.337	1.051	.	.
JUN	1.397	1.352	.	1.211
OCT	1.308	1.399	1.337	1.335
DEC	1.278	1.186	1.228	1.154
MAGNESIUM (MG/L)		DET'N LIMIT = 0.10		GUIDELINE = 30 (F2)
FEB	19.100	18.450	.	.
JUN	19.150	18.450	.	17.750
OCT	21.050	21.000	20.800	20.850
DEC	19.400	19.700	19.400	19.500
SODIUM (MG/L)		DET'N LIMIT = 0.2		GUIDELINE = 200 (A4)
FEB	15.000	17.900	.	.
JUN	11.100	22.300	.	20.900
OCT	12.100	16.500	16.500	16.400
DEC	9.400	12.800	11.600	11.800
AMMONIUM TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = 0.05 (F2)
FEB	.194	.092	.	.
JUN	BDL	BDL	.	BDL
OCT	.006 <T	.008 <T	.010	.006 <T
DEC	BDL	.006 <T	.008 <T	.004 <T
NITRITE (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = 1 (A1)
FEB	.026	.007	.	.
JUN	.160	.013	.	.012
OCT	.013	.003 <T	.004 <T	.003 <T
DEC	.027	BDL	.001 <T	BDL
TOTAL NITRATES (MG/L)		DET'N LIMIT = 0.005		GUIDELINE = 10 (A1)
FEB	7.180	7.450	.	.
JUN	8.500	8.100	.	4.450
OCT	5.000	5.040	5.320	5.350
DEC	5.830	5.750	5.600	5.730

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

STANDING

FREE FLOW

NITROGEN TOT KJELD (MG/L)		DET'N LIMIT = 0.02		GUIDELINE = N/A
FEB	.720	.440	.	.
JUN	.500	.550	.	.370
OCT	.560	.330	.350	.360
DEC	.875	.350	.410	.370
PH (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)
FEB	8.430	8.350	.	.
JUN	8.510	8.470	.	8.400
OCT	8.320	8.400	8.430	8.440
DEC	8.310	8.240	8.280	8.210
PHOSPHORUS FIL REACT (MG/L)		DET'N LIMIT = 0.0005		GUIDELINE = N/A
FEB	.027	.001 <T	.	.
JUN	.030	.002 <T	.	.
OCT	.009	.002	.	.
DEC	.017	.002 <T	.	.
PHOSPHORUS TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = .40 (F2)
FEB	.055	.018	.	.
JUN	.062	.006 <T	.	.
OCT	.029	.006 <T	.	.
DEC	.075	.008 <T	.	.
SULPHATE (MG/L)		DET'N LIMIT = .200		GUIDELINE = 500 (A3)
FEB	74.070	114.180	.	.
JUN	57.170	93.800	.	89.880
OCT	57.910	71.800	69.440	68.980
DEC	57.220	66.880	65.870	67.240
TURBIDITY (FTU)		DET'N LIMIT = 0.05		GUIDELINE = 1 (A1)
FEB	10.900	.540	.	.
JUN	73.000	.220	.	.580
OCT	19.000	1.500	1.600	1.500
DEC	37.000	.760	.530	.540

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

STANDING

FREE FLOW

METALS					
				DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)
ALUMINUM (UG/L)					
FEB	120.000	500.000	.	.	.
JUN	430.000	550.000	.	.	370.000
OCT	110.000	300.000	280.000	.	290.000
DEC	370.000	120.000	97.000	.	100.000
ARSENIC (UG/L)				DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)
FEB	1.100	.860 <T	.	.	.
JUN	1.700	.660 <T	.	.	.580 <T
OCT	1.600	1.000 <T	.960 <T	.	.840 <T
DEC	.740 <T	.290 <T	.350 <T	.	.330 <T
BARIUM (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)
FEB	45.000	15.000	.	.	.
JUN	58.000	39.000	.	.	38.000
OCT	44.000	34.000	28.000	.	28.000
DEC	42.000	32.000	30.000	.	29.000
BORON (UG/L)				DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)
FEB	52.000	48.000	.	.	.
JUN	53.000	59.000	.	.	51.000
OCT	36.000	55.000	54.000	.	56.000
DEC	37.000	48.000	50.000	.	51.000
BERYLLIUM (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)
FEB	BDL	BDL	.	.	.
JUN	.110 <T	.070 <T	.	.	BDL
OCT	BDL	BDL	BDL	.	BDL
DEC	.080 <T	BDL	.080 <T	.	.060 <T
CADMIUM (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)
FEB	BDL	BDL	.	.	.
JUN	BDL	.170 <T	.	.	BDL
OCT	BDL	BDL	BDL	.	BDL
DEC	BDL	BDL	BDL	.	BDL
COBALT (UG/L)				DET'N LIMIT = 0.02	GUIDELINE = N/A
FEB	.100 <T	BDL	.	.	.
JUN	.800 <T	.060 <T	.	.	BDL
OCT	.310 <T	.240 <T	.160 <T	.	.160 <T
DEC	.340 <T	.110 <T	.080 <T	.	.070 <T
CHROMIUM (UG/L)				DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)
FEB	4.100 <T	2.900 <T	.	.	.
JUN	5.200	4.700 <T	.	.	3.800 <T
OCT	2.600 <T	4.100 <T	5.100	.	5.400
DEC	4.700 <T	3.900 <T	4.600 <T	.	4.500 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

STANDING

FREE FLOW

			DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)
COPPER (UG/L)				
FEB	1.600 <T	.720 <T	.	.
JUN	2.500 <T	3.500 <T	.	2.100 <T
OCT	1.300 <T	1.100 <T	2.800 <T	1.800 <T
DEC	1.700 <T	1.700 <T	2.600 <T	1.700 <T
IRON (UG/L)				
			DET'N LIMIT = 6.00	GUIDELINE = 300 (A3)
FEB	240.000	BDL	.	.
JUN	730.000	BDL	.	BDL
OCT	230.000	BDL	BDL	BDL
DEC	480.000	9.900 <T	BDL	BDL
MERCURY (UG/L)				
			DET'N LIMIT = 0.02	GUIDELINE = 1 (A1)
FEB	BDL	BDL	.	.
JUN	BDL	BDL	.	.
OCT	.070 <T	BDL	.	.
DEC	BDL	BDL	.	.
MANGANESE (UG/L)				
			DET'N LIMIT = 0.05	GUIDELINE = 50 (A3)
FEB	41.000	4.100	.	.
JUN	94.000	1.600	.	2.200
OCT	25.000	1.200	.920	.920
DEC	34.000	1.700	1.300	1.600
MOLYBDENUM (UG/L)				
			DET'N LIMIT = 0.05	GUIDELINE = N/A
FEB	.650	.890	.	.
JUN	.440 <T	1.400	.	1.100
OCT	.590	.950	.990	.990
DEC	.300 <T	.770	.750	.760
NICKEL (UG/L)				
			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)
FEB	BDL	BDL	.	.
JUN	.290 <T	BDL	.	BDL
OCT	1.700 <T	1.400 <T	.540 <T	.530 <T
DEC	BDL	BDL	.370 <T	BDL
LEAD (UG/L)				
			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)
FEB	.360 <T	BDL	.	.
JUN	1.600	.230 <T	.	.240 <T
OCT	.350 <T	.100 <T	.320 <T	.210 <T
DEC	.580	.110 <T	.240 <T	.100 <T
ANTIMONY (UG/L)				
			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)
FEB	.420 <T	.530	.	.
JUN	.290 <T	.400 <T	.	.470 <T
OCT	.370 <T	.420 <T	.470 <T	.470 <T
DEC	.230 <T	.460 <T	.420 <T	.450 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED		SITE 1	
		STANDING		FREE FLOW	
SELENIUM (UG/L)		DET'N LIMIT = 1.00		GUIDELINE = 10 (A1)	
FEB	1.300 <T	1.300 <T	.	.	.
JUN	1.400 <T	2.200 <T	.	1.700 <T	.
OCT	BDL	1.300 <T	1.100 <T	1.200 <T	.
DEC	BDL	BDL	1.300 <T	1.100 <T	.
STRONTIUM (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = N/A	
FEB	250.000	200.000	.	.	.
JUN	260.000	240.000	.	210.000	.
OCT	230.000	240.000	220.000	220.000	.
DEC	230.000	240.000	230.000	220.000	.
TITANIUM (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = N/A	
FEB	15.000	12.000	.	.	.
JUN	27.000	16.000	.	15.000	.
OCT	13.000	8.200	7.200	7.200	.
DEC	13.000	9.100	8.700	8.900	.
URANIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 100 (A1)	
FEB	2.300	1.800	.	.	.
JUN	1.800	1.700	.	1.500	.
OCT	2.000	2.100	2.200	2.100	.
DEC	2.100	2.100	1.900	2.000	.
VANADIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = N/A	
FEB	.810	2.600	.	.	.
JUN	2.100	3.600	.	3.300	.
OCT	.730	1.800	2.100	2.000	.
DEC	.980	1.200	1.300	1.200	.
ZINC (UG/L)		DET'N LIMIT = 0.20		GUIDELINE = 5000 (A3)	
FEB	3.400	1.900 <T	.	.	.
JUN	7.100	5.800	.	3.300	.
OCT	3.400	3.000	3.000	2.500	.
DEC	4.300	1.600 <T	2.800	1.700 <T	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

			STANDING	FREE FLOW
PESTICIDES & PCB				
LINDANE (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 4000 (A1)
FEB	BDL	BDL	.	.
JUN	BDL	BDL	.	BDL
OCT	2.000 <T	BDL	.	BDL
DEC	2.000 <T	BDL	.	BDL
ENDOSULFAN 1 (NG/L)				
			DET'N LIMIT = 2.000	GUIDELINE = 74000 (D4)
FEB	5.000 <T	BDL	.	.
JUN	BDL	BDL	.	BDL
OCT	BDL	BDL	.	BDL
DEC	BDL	BDL	.	BDL
ATRAZINE (NG/L)				
			DET'N LIMIT = 50	GUIDELINE = 60000 (A2)
FEB	250.000 <T	BDL	.	.
JUN	2430.000	520.000	.	.
OCT	270.000 <T	BDL	.	.
DEC	260.000 <T	BDL	.	.
DESETHYLATRAZINE (NG/L)				
			DET'N LIMIT = 200.0	GUIDELINE = 60000 (A2)
FEB	BDL	BDL	.	.
JUN	600.000 <T	BDL	.	.
OCT	250.000 <T	BDL	.	.
DEC	250.000 <T	BDL	.	.
METOLACHLOR (NG/L)				
			DET'N LIMIT = 500.	GUIDELINE = 50000 (A2)
FEB	BDL	BDL	.	.
JUN	700.000 <T	BDL	.	.
OCT	BDL	BDL	.	.
DEC	BDL	BDL	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

STANDING

FREE FLOW

PHENOLICS (UG/L)		PHENOLICS)		DET'N LIMIT = .200	GUIDELINE = 2	(A4)
FEB	BDL	BDL	BDL	.	.	
JUN	BDL	BDL	BDL	.	.	
OCT	.600 <T	.800 <T	.800 <T	.	.	
DEC	1.200	1.000	1.000	.	.	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

STANDING

FREE FLOW

SPECIFIC PESTICIDES
)

CARBARYL (NG/L

DET'N LIMIT = 200.

GUIDELINE = 90000 (A1)

JUN 6200.000 1100.000 <T
OCT BDL BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED	SITE 1	
		STANDING	FREE FLOW	
<hr/>				
VOLATILES				
TOLUENE (UG/L)	)	DET'N LIMIT = 0.05	GUIDELINE = 24 (A3)	
FEB	BDL	BDL	.	.
JUN	BDL	BDL	.	.200 <T
OCT	BDL	BDL	.	BDL
DEC	BDL	BDL	.	BDL
<hr/>				
ETHYLBENZENE (UG/L)		DET'N LIMIT = 0.05	GUIDELINE = 2.4 (A3)	
FEB	BDL	BDL	.	.
JUN	BDL	.050 <T	.	.050 <T
OCT	.100 <T	.100 <T	.	.050 <T
DEC	BDL	.100 <T	.	.050 <T
<hr/>				
M-XYLENE (UG/L)		DET'N LIMIT = 0.10	GUIDELINE = 300 (A3*)	
FEB	BDL	BDL	.	.
JUN	BDL	BDL	.	.200 <T
OCT	BDL	BDL	.	BDL
DEC	BDL	BDL	.	BDL
<hr/>				
O-XYLENE (UG/L)		DET'N LIMIT = 0.05	GUIDELINE = 300 (A3*)	
FEB	BDL	BDL	.	.
JUN	BDL	BDL	.	.100 <T
OCT	BDL	BDL	.	BDL
DEC	BDL	BDL	.	BDL
<hr/>				
STYRENE (UG/L)		DET'N LIMIT = 0.05	GUIDELINE = 100 (D1)	
FEB	.050 <T	.050 <T	.	.
JUN	BDL	.100 <T	.	BDL
OCT	.100 <T	.100 <T	.	.100 <T
DEC	.050 <T	.100 <T	.	.100 <T
<hr/>				
CHLOROFORM (UG/L)		DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)	
FEB	BDL	11.700	.	.
JUN	BDL	111.600	.	136.300
OCT	BDL	68.000	.	68.200
DEC	BDL	56.500	.	31.100
<hr/>				
111, TRICHLOROETHANE (UG/L)		DET'N LIMIT = 0.02	GUIDELINE = 200 (D1)	
FEB	BDL	BDL	.	.
JUN	BDL	BDL	.	BDL
OCT	BDL	BDL	.	BDL
DEC	.040 <T	BDL	.	BDL
<hr/>				
DICHLOROBROMOMETHANE (UG/L)		DET'N LIMIT = 0.05	GUIDELINE = 350 (A1+)	
FEB	BDL	3.400	.	.
JUN	BDL	25.150	.	27.100
OCT	BDL	16.050	.	15.800
DEC	BDL	15.000	.	12.250

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM ALVINSTON WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 1

STANDING

FREE FLOW

CHLORODIBROMOMETHANE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)
FEB	BDL	.600 <T	.	.
JUN	BDL	4.000	.	4.800
OCT	BDL	2.800	.	2.700
DEC	BDL	2.300	.	2.800
T-CHLOROETHYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (D1)
FEB	BDL	BDL	.	.
JUN	BDL	.050 <T	.	.050 <T
OCT	BDL	BDL	.	BDL
DEC	BDL	BDL	.	BDL
TOTL TRIHALOMETHANES (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 350 (A1)
FEB	BDL	15.750	.	.
JUN	BDL	140.850	.	168.200
OCT	BDL	86.850	.	86.700
DEC	BDL	73.700	.	46.100

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TRICHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRAZONE	NG/L	50.0	N/A
ATRAZONE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZONE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEx)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLOROPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGOW)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHYLENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

- i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;
- ii/ the water being sampled is not being modified by the sampling system;
- iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and
- iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P)

VOLATILES

CLASS: HEALTH METHOD: POCODO UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION:NAME: BENZENE

CAS#: 71-43-2

MOLECULAR FORMULAE: C₆H₆

DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L

SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27).
CYCLOHEXATRIENE (41).

CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).

PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41).
THRESHOLD ODOUR: 0.5 - 10 PPM IN WATER
THRESHOLD TASTE: 0.5 mg/L IN WATER (39).

ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).

SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF

OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).

ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE. CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.

MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:

MOLECULAR WEIGHT: 78.12

MELTING POINT: 5.5°C (27).

BOILING POINT: 80.1°C (27).

SPECIFIC GRAVITY: 0.8790 AT 20°C (27).

VAPOUR PRESSURE: 100 MM AT 26.1°C (27).

HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).

LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).

CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41) SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	<ul style="list-style-type: none">-500 mL plastic bottle (PET 500)-rinse bottle and cap with sample water three times-fill to 2 cm from top
Bacteriological	<ul style="list-style-type: none">-220 mL plastic bottle with white seal on cap-do <u>not</u> rinse bottle, preservative has been added-avoid touching bottle neck or inside of cap-fill to top of red label as marked
Metals	<ul style="list-style-type: none">-500 mL plastic bottle (PET 500)-rinse bottle and cap three times-fill to 2 cm from top-add 10 drops nitric acid (HNO_3) (Caution: HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	<ul style="list-style-type: none">-45 mL glass vial with septum (teflon side must be in contact with sample)-do <u>not</u> rinse bottle-fill bottle completely without bubbles
Organics (OWOC), (OWTRI), (OAPAHX)	<ul style="list-style-type: none">-1 L amber glass bottle per scan-do <u>not</u> rinse bottle-fill to 2 cm from top-when 'special pesticides' are requested three extra bottles must be filled
Cyanide	<ul style="list-style-type: none">-500 mL plastic bottle (PET 500)-rinse bottle and cap three times-fill to 2 cm from top-add 10 drops sodium hydroxide (NaOH) (Caution: NaOH is corrosive)

Mercury	<ul style="list-style-type: none"> -250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) (Caution: HNO_3 & $\text{K}_2\text{Cr}_2\text{O}_7$ are corrosive)
Phenols	<ul style="list-style-type: none"> -250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	<ul style="list-style-type: none"> -4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	<ul style="list-style-type: none"> -1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

Steps:

1. Let sampling water tap run for an adequate time to clear the sample line.
2. Record time of day on submission sheet.
3. Record temperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	<ul style="list-style-type: none"> -500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
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Metals

- 500 mL plastic bottle (PET 500)
- rinse bottle and cap three times
- fill to 2 cm from top
- add 10 drops nitric acid (HNO_3)
(Caution: HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry

- 500 mL plastic bottle (PET 500)
- rinse bottle and cap with sample water three times
- fill to 2 cm from top

Bacteriological

- 250 mL plastic bottle with white seal on cap
- do not rinse bottle, preservative has been added
- avoid touching bottle neck or inside of cap
- fill to top of red label as marked

Metals

- 500 mL plastic bottle (PET 500)
- rinse bottle and cap three times
- fill to 2 cm from top
- add 10 drops nitric acid HNO_3
(Caution: HNO_3 is corrosive)

Volatiles (duplicate)
(OPOPUP)

- 45 mL glass vial with septum
(teflon side must be in contact
with sample)
- do not rinse bottle, preservative
has been added
- fill bottle completely without
bubbles

Organics
(OWOC) (OAPAHX)

- 1 L amber glass bottle per scan
- do not rinse bottle
- fill to 2 cm from top

Steps:

1. Record time of day on submission sheet.
2. Let cold water flow for five minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total),
turbidity and pH on submission sheet.

